IN THE SPECIFICATION

Please amend the specification as follows:

Please substitute the paragraph beginning at page 1, line 6, with the following.

--The present invention relates to an exposure apparatus used in ~~the~~ a lithography step of the steps in manufacturing a device, e.g., a semiconductor device such as an IC or LSI, a liquid crystal device, an image sensing device such as a CCD, or a magnetic head, and a device manufacturing method using the exposure apparatus.--

Please substitute the paragraph beginning at page 1, line 15, and ending on page 2, line 1, with the following.

--In a manufacturing process of a semiconductor integrated circuit, an exposure apparatus is used to form a pattern on a photosensitive material (to be referred to as a "resist" hereinafter) on a substrate (to be referred to as a "wafer" hereinafter). With an increase in the area of recent semiconductor integrated circuits and an advance in micropatterning, a scanning exposure apparatus called a step-and-scan exposure apparatus designed to illuminate part of a pattern on a mask as a master in the form of a slit, and to perform exposure by synchronously scanning the mask and a wafer at a constant velocity is replacing a conventional step-and-repeat exposure apparatus, a so-called stepper, which is designed for cell projection of a mask pattern.--

Please substitute the paragraph beginning at page 2, line 23, and ending on page 3, line 16, with the following.

--One of the factors responsible for the above requirement is that the positions of a mask

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and wafer cannot be properly controlled to result in a deviation (to be referred to as a "synchronization error" hereinafter), i.e., a deviation from a predetermined positional relationship between the mask and the wafer, in the scanning exposure apparatus designed to form a mask pattern on the wafer by scanning/exposing the mask and wafer while performing synchronous control to keep the positions of the mask and wafer in the predetermined positional relationship. This leads to a decrease in the resolution of a resist pattern and a deviation from the proper imaging position of the resist pattern, resulting in a trouble in the manufacture of a semiconductor integrated circuit. This synchronization error is almost proportional to the scanning velocity. As the scanning velocity increases, the synchronization error increases. For this reason, the maximum scanning velocity Vmax that suppresses the synchronization error with an allowable synchronization error range is determined.--

Please substitute the paragraph beginning at page 3, line 17, and ending on page 4, line 3, with the following.

--If a pulsed light source such as a KrF excimer laser or an ArF excimer laser is used as an exposure light source to meet the requirement for micropatterning, since pulsed light varies in energy for each pulse, an integrated exposure amount is made uniform within a desired precision by performing exposure with a plurality of pulsed light beams equal to or larger than a predetermined pulse count (to be referred to as a "minimum exposure pulse count" hereinafter) Pmin. For this reason, in the scanning exposure apparatus, the following inequality must be satisfied:

$$P\min \leq Ws / V \times f \qquad \qquad \ldots (4)$$

where f (Hz) is the oscillation frequency of the exposure light source laser.--

Please substitute the paragraph beginning at page 4, line 4, with the following.

--According to the inequality, letting fmax be the maximum oscillation frequency of the exposure light source laser, the maximum scanning velocity controlled by the minimum scanning velocity controlled by the minimum exposure pulse count Pmin is given by

$$Vp = Ws/Pmin \times fmax \qquad \ldots (5)$$

Please substitute the paragraph beginning at page 4, line 18, with the following.

--If the integrated exposure amount can be set to Pmin regardless of the maximum scanning velocity Vd controlled by the set exposure amount D represented by equation (2), the maximum scanning velocity Vmax controlled in accordance with the performance of the apparatus, and the value of the set exposure amount D, the minimum value of Vp controlled in accordance with the performance of the apparatus, and the value of the set exposure amount D, the minimum value of Vp controlled by the minimum exposure pulse count represented by equation (5) is determined as a scanning velocity in an actual exposure operation.--

Please substitute the paragraph beginning at page 6, line 3, with the following.

--This indicates that the throughput increases as the scanning velocity increases. Obviously, in a scanning exposure apparatus designed to illuminate a pattern area to be exposed in the form of a slit and to perform exposure by synchronously scanning a mask and wafer at a constant velocity, the time required to scan the pattern area to be exposed shortens as the

scanning velocity increases while the length of the pattern area to be exposed in the scanning direction remains unchanged.--

Please substitute the paragraph beginning at page 6, line 13, and ending on page 7, line 7, with the following.

--However, after one pattern area is exposed, both the mask stage and the wafer stage are temporarily stopped. Thereafter, the next pattern area is exposed by scanning the stages in the opposite direction. To increase the mask and wafer scanning velocities, therefore, is to prolong the time required to accelerate each scanning velocity to the above scanning velocity and the time required to decelerate each of the mask and wafer scanning velocities to 0. At a given scanning velocity or higher, since the time required to scan a pattern area to be exposed shortens because of an increase in scanning velocity. However, the time required to accelerate each of the mask and wafer scanning velocities to the scanning velocity in the pattern area to be exposed and the time required to decelerate each scanning velocity to 0 is prolonged more than the time is shortened. As a result, the total time required to start driving a mask and wafer, to reach the scanning velocity in a pattern area to be exposed, and to complete a driving operation of the mask and wafer may be prolonged as the scanning velocity is increased, resulting in a reduction in throughput.--

Please substitute the paragraph beginning at page 7, line 26, and ending on page 8, line 1, with the following.

--The scanning velocity determining means determines, as a scanning velocity in an actual exposure operation, a lowest one of--

Please substitute the paragraph beginning at page 8, line 13, with the following.

--If the light source is a light source for emitting pulsed light, the scanning velocity determining means determines, as a scanning velocity in an actual exposure operation, a lowest one of--

Please substitute the paragraph beginning at page 10, line 17, with the following.

--By determining a scanning velocity in this manner, a maximum throughput can always be obtained, and hence, the productivity of devices can be increased.--

Please substitute the paragraph beginning at page 11, line 4, with the following.

--Fig. 2 is a view for explaining a shot area and an exposure slit in scanning exposure;--

Please substitute the paragraph beginning at page 15, line 18, and ending on page 16, line 10, with the following.

--After all desired shot areas on the wafer 12 are completely exposed, the wafer 12 is transferred outside the exposure apparatus from the wafer stage 13 through a wafer recovery/transfer system 18. At the same time, the next wafer is supplied onto the wafer stage 13 via a wafer supply/transfer 19 (identical to the wafer recovery/transfer system 18 in Fig. 1 for the sake of illustrative convenience). Thereafter, an alignment system (not shown) performs

positioning with the pattern that has already been formed on the wafer 12. According to one alignment method, the positions of alignment marks mainly formed on peripheral portions of a plurality of shot areas selected on the wafer 12 to obtain rotation, expansion/contraction, and shift offsets, and the like of the wafer 12, thereby positioning all shot areas on the wafer 12. Coarse alignment for the detection of alignment marks is sometimes performed before this fine alignment. After each shot area is positioned in this manner, the above exposure operation is repeatedly performed. --

Please substitute the paragraph beginning at page 23, line 7, with the following.

-- Fig. 4 shows an example of the relationship between among the time, the wafer stage velocity, and the mask stage velocity. In this case, the scanning direction coincides with the Y-axis, and the non-scanning direction coincides with the X-axis. Referring to Fig. 4, the upper, intermediate, and lower charts schematically show the relationships between the velocity of the wafer stage 13 in the Y-axis direction and the time, between the velocity of the wafer stage 13 in the X-axis direction and the time, and between the velocity of the mask stage 9 in the Y-axis direction and the time, respectively. --

Please substitute the paragraph beginning at page 25, line 21, with the following.

-- Since the accelerations $\alpha accel$ and $\alpha decel$ take the maximum values in terms of the capacity of the apparatus to shorten the acceleration and deceleration times, these values can be regarded as constant values. Differential A differential of the second order taking Vscan as a variable is expressed as follows:

A16
and

$$\partial^2/\partial V^2 scan = 2 \times L/V^3 \geq 0 \text{.--}$$

Please substitute the paragraph beginning at page 26, line 8, with the following.

A17

--Letting Tstep be the sum of the step times in the scanning direction between t_A4 and t_A6, t_B4 and t_B6, t_C4 and t_C6, . . ., and Nshot be the number of shot areas per wafer, the time Tscan required for scanning exposure is given by

Tscan = Tstep + Nshot ×tscan(Vscan).--

Please substitute the paragraph beginning at page 26, line 19, with the following.

A18

--As described above so far, all the times except for Tscan (Vscan) need not be regarded as functions of Vscan, and are constant values, and hence, the time T required to process one wafer at the scanning velocity Vscan.min takes a minimum value. That is, the maximum number of wafers processed is set.--

Please substitute the paragraph beginning at page 28, line 22, with the following.

A19

--In practice, a scanning velocity must be so determined as to satisfy equations (6), (8), and (10) as well. For this reason, a scanning velocity V_A that minimizes the time period from the start of scanning of the shot area A to the end of scanning while satisfying equations (6), (8) and (10) is given by

V_A = min(Vmax, Vd, Vp, Vscan.minA).

In the shot area B,

V_B = min(Vmax, Vd, Vp, Vscan.minB).--

Please substitute the paragraph beginning at page 32, line 17, with the following.

¶20

--(Embodiment of <u>A</u> Semiconductor Production System)--

Please substitute the paragraph beginning at page 32, line 18, and ending on page 33, line 1, with the following.

¶21

--A production system for producing a semiconductor device (<u>e.g., a</u> semiconductor chip such as an IC or LSI, <u>a</u> liquid crystal panel, <u>a</u> CCD, <u>a</u> thin-film magnetic head, <u>a</u> micromachine, or the like) by using the exposure apparatus according to the present invention will be exemplified. A trouble remedy or periodic maintenance of a manufacturing apparatus installed in a semiconductor manufacturing factory, or maintenance service such as software distribution is performed by using a computer network outside the manufacturing factory.--

Please substitute the paragraph beginning at page 33, line 2, with the following.

¶22
cont'd

--Fig. 8 shows the overall system cut out at a given angle. In Fig. 8, reference numeral 1101 denotes a business office of a vendor (<u>e.g., an</u> apparatus supply manufacturer), which provides a semiconductor device manufacturing apparatus. Assumed examples of the manufacturing apparatus are semiconductor manufacturing apparatuses for <u>performing</u> various processes used in a semiconductor manufacturing factory, such as pre-process apparatuses (<u>e.g., a</u> lithography apparatus including an exposure apparatus, <u>a</u> resist processing apparatus, and <u>an</u> etching apparatus, <u>an</u> annealing apparatus, <u>a</u> film formation apparatus, <u>a</u> planarization apparatus, and the like) and post-process apparatuses (<u>e.g., an</u> assembly apparatus, <u>an</u> inspection apparatus, and the like). The business office 1101 comprises a host management system 1108 for providing

a maintenance database for the manufacturing apparatus, a plurality of operation terminal computers 1110 , and a LAN (Local Area Network) 1109, which connects the host management system 1108 and computers 1110 to build an intranet. The host management system 1108 has a gateway for connecting the LAN 1109 to Internet 1105 as an external network of the business office, and a security function for limiting external accesses.--

Please substitute the paragraph beginning at page 33, line 26, and ending on page 35, line 12, with the following.

--Reference numerals 1102 to 1104 denote manufacturing factories of the semiconductor manufacturer as users of manufacturing apparatuses. The manufacturing factories 1102 to 1104 may belong to different manufacturers or the same manufacturer (e.g., a pre-process factory, a post-process factory, and the like). Each of the factories 1102 to 1104 is equipped with a plurality of manufacturing apparatuses 1106, a LAN (Local Area Network) 1111, which connects these apparatuses 1106 to construct an intranet, and a host management system 1107 serving as a monitoring apparatus for monitoring the operation status of each manufacturing apparatus 1106. The host management system 1107 in each of the factories 1102 to 1104 has a gateway for connecting the LAN 111 in the factory to the Internet 1105 as an external network of the factory. Each factory can access the host management system 1108 of the vendor 1101 from the LAN 111 via the Internet 1105. The security function of the host management system 1108 authorizes access of only a limited user. More specifically, the factory notifies the vendor via the Internet 1105 of status information (e.g., the symptom of a manufacturing apparatus in trouble) representing the operation status of each manufacturing apparatus 1106, and receives response

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information (e.g., information designating a remedy against the trouble, or remedy software or data) corresponding to the notification, or maintenance information such as the latest software or help information. Data communication between the factories 1102 to 1104 and the vendor 1101 and data communication via the LAN 1111 in each factory adopt a communication protocol (TCP/IP) generally used in the Internet. Instead of using the Internet as an external network of the factory, a dedicated network (e.g., an ISDN) having high security which inhibits access of a third party can be adopted. Also, the user may construct a database in addition to the one provided by the vendor and set the database on an external network, and the host management system may authorize access to the database from a plurality of user factories.--

Please substitute the paragraph beginning at page 35, line 13, and ending on page 36, line 13, with the following.

--Fig. 9 is a view showing the concept of the overall system of this embodiment that is cut out at a different angle from Fig. 8. In the above example, a plurality of user factories having manufacturing apparatuses and the management system of the manufacturing apparatus vendor are connected via an external network, and production management of each factory or information of at least one manufacturing apparatus is communicated via the external network. In the example of Fig. 9, a factory having manufacturing apparatuses of a plurality of vendors and the management systems of the vendors for these manufacturing apparatuses are connected via the external network of the factory, and maintenance information of each manufacturing apparatus is communicated. In Fig. 9, reference numeral 1201 denotes a manufacturing factory of a manufacturing apparatus user (e.g., a semiconductor device manufacturer) where

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manufacturing apparatuses for <u>performing</u> various processes, (e.g., an exposure apparatus 1202, <u>a</u> resist processing apparatus 1203, and <u>a</u> film formation apparatus 1204) are installed in the manufacturing line of the factory. Fig. 9 shows only one manufacturing factory 1201, but a plurality of factories are networked in practice. The respective apparatuses in the factory are connected to a LAN 1206 to build an intranet, and a host management system 1205 manages the operation of the manufacturing line. --

Please substitute the paragraph beginning at page 36, line 14, and ending on page 37, line 7, with the following.

-- The business office of vendors (<u>e.g.,</u> apparatus supply manufacturers) such as an exposure apparatus manufacturer 1210, <u>a</u> resist processing apparatus manufacturer 1220, and <u>a</u> film formation apparatus manufacturer 1230 comprise host management systems 1211, 1221, and 1231 for executing remote maintenance for the supplied apparatuses. Each host management system has a maintenance database and a gateway for an external network, as described above. The host management system 1205 for managing the apparatuses in the manufacturing factory of the user, and the management systems 1211, 1221, and 1231 of the vendors for the respective apparatuses are connected via the Internet or dedicated network serving as an external network 1200. If a trouble occurs in any one of a series of manufacturing apparatuses along the manufacturing line in this system, the operation of the manufacturing line stops. This trouble can be quickly solved by remote maintenance from the vendor of the apparatus in trouble via the Internet 1200. This can minimize the ~~stop~~ <u>stoppage</u> of the manufacturing line. --

Please substitute the paragraph beginning at page 37, line 8, and ending on page 38, line 12, with the following.

--Each manufacturing apparatus in the semiconductor manufacturing factory comprises a display, a network interface, and a computer for executing network access software and apparatus operating software, which are stored in a storage device. The storage device is a built-in memory, hard disk, or network file server. The network access software includes a dedicated or general-purpose web browser, and provides a user interface having a window as shown in Fig. 10 on the display. While referring to this window, the operator who manages manufacturing apparatuses in each factory inputs, in input items on the windows, pieces of information such as the type of manufacturing apparatus 1401, serial number 1402, object of trouble 1403, occurrence date 1404, degree of urgency 1405, symptom 1406, remedy 1407, and progress 1408. The pieces of input information are transmitted to the maintenance database via the Internet, and appropriate maintenance information is sent back from the maintenance database and displayed on the display. The user interface provided by the web browser realizes hyperlink functions 1410 to 1412, as shown in Fig. 10. This allows the operator to access detailed information of each item, to receive the latest-version software to be used for a manufacturing apparatus from a software library provided by a vendor, and to receive an operation guide (help information) as a reference for the operator in the factory. Maintenance information provided by the maintenance database also includes information concerning the present invention described above. The software library also provides the latest software for implementing the present invention. --

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Please substitute the paragraph beginning at page 38, line 13, and ending on page 39, line 13, with the following.

--A semiconductor device manufacturing process using the above-described production system will be explained. Fig. 11 shows the flow of the whole manufacturing process of the semiconductor device. In step 1 (circuit design), a semiconductor device circuit is designed. In step 2 (mask formation), a mask having the designed circuit pattern is formed. In step 3 (wafer manufacture), a wafer is manufactured by using a material such as silicon. In step 4 (wafer process), called a pre-process, an actual circuit is formed on the wafer by lithography using a prepared mask and the wafer. Step 5 (assembly), called a post process is the step of forming a semiconductor chip by using the wafer manufactured in step 4, and includes an assembly process (dicing and bonding) and a packaging process (chip encapsulation). In step 6 (inspection), inspections such as the operation confirmation test and durability test of the semiconductor device manufactured in step 5 are conducted. After these steps, the semiconductor device is completed and shipped (step 7). For example, the pre-process and post-process are performed in separate dedicated factories, and maintenance is done for each of the factories by the above-described remote maintenance system. Information for production management and apparatus maintenance is communicated between the pre-process factory and the post-process factory via the Internet or dedicated network.--

Please substitute the paragraph beginning at page 39, line 14, and ending on page 40, line 9, with the following.

--Fig. 12 shows the detailed flow of the wafer process. In step 11 (oxidation), the wafer surface is oxidized. In step 12 (CVD), an insulating film is formed on the wafer surface. In step 13 (electrode formation), an electrode is formed on the wafer by vapor deposition. In step 14 (ion implantation), ions are implanted in the wafer. In step 15 (resist processing), a photosensitive agent is applied to the wafer. In step 16 (exposure), the exposure apparatus described above exposes the wafer to the circuit pattern of a mask. In step 17 (developing), the exposed wafer is developed. In step 18 (etching), the resist is etched except for the developed resist image. In step 19 (resist removal), an unnecessary resist after etching is removed. These steps are repeated to form multiple circuit patterns on the wafer. A manufacturing apparatus used in each step undergoes maintenance by the remote maintenance system, which prevents a trouble in advance. Even if a trouble occurs, the manufacturing apparatus can be quickly recovered. The productivity of the semiconductor device can be increased in comparison with the prior art.--